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# The discovery of *Syncephalis obliqua* (*Zoopagomycotina, Zoopagales*) in the Neotropics

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Abstract — During an investigation on coprophilous fungi from Brazil, several sporangiophores of a mycoparasitic fungus were recovered from horse dung collected in Recife, Pernambuco, Northeastern Brazil, and identified as *Syncephalis obliqua*. This is the first record of the species in the Neotropics, as well as in a host growing on herbivore dung, and its second world record. A detailed description and high quality images are provided, along with an identification key to all *Syncephalis* species recorded in Brazil.

Key words — *Piptocephalidaceae*, taxonomy

## Introduction

*Syncephalis* was first described by van Tieghem & Le Monnier (1873), and c. 60 species are accepted (Ho & Benny 2008, Kirk et al. 2008). The genus includes haustorial mycoparasites of *Mortierellales*, *Mucorales*, or (less commonly) ascomycetes, forming coenocytic aerial hyphae in or over the host, merosporangiophores with basal rhizoids, and usually with apical fertile vesicles bearing several one- to multi-spored merosporangia. Zygospores, when present, are globose to subglobose, ornamented, with apposed suspensors, possibly adorned with a multi-lobed vesicle (Benny 2011). Most records are associated with mucoraceous hosts in soil and dung (Santiago et al. 2010).

In Brazil, only seven species have previously been recorded: *S. aggregata* A.L. Santiago & Benny, *S. asymmetrica* Tiegh. & G. Le Monn., *S. clavata* H.M. Ho & Benny, *S. cornu* Tiegh. & G. Le Monn., *S. penicillata* Indoh, *S. sphaerica* Tiegh., and *S. tengi* S.H. Ou (Trufem 1984, Trufem & Viriato 1985, Melo et al. 2011).

*Syncephalis obliqua* was described by Ho & Benny (2008) parasitizing a *Mucor* species from soil samples collected in Taiwan. Here we present the second world record of *S. obliqua*, identified as a mycoparasite of coprophilous ascomycetes on herbivore dung from Brazil and recorded for the first time in the Neotropics.

## Materials & methods

Samples of cattle, goat and horse dung collected in clean plastic bags on the campus of Universidade Federal Rural de Pernambuco, Recife (8°00′54″S 34°56′59″W) were taken to the laboratory and incubated in moist chambers (9 cm diam. Petri dishes with a moistened disk of filter paper) at room temperature (28 ± 2°C) for at least 20 days under alternating natural light and dark periods. The specimens were observed directly from the substrata under a Leica EZ4 stereomicroscope; sporangiophores were mounted in slides with tap water, lactophenol plus cotton blue, or Polyvinyl-Lacto-Glycerol and examined with the aid of a Leica DM500 light microscope. Specimens were identified based on Benny (2011), Ho & Benny (2008), and Santiago et al. (2011). A careful literature review and survey of Brazilian herbaria were performed in order to access information regarding older *Syncephalis* records. High quality images were captured with a QImaging QColor 3 digital camera mounted on an Olympus BX51 compound microscope using differential interference or phase contrast microscopy. Permanent slides were deposited in Herbário Padre Camille Torrend, Departamento de Micologia, Universidade Federal de Pernambuco, Recife, Brazil (URM). Additional information regarding deposit records can be accessed at the "INCT - Herbário Virtual da Flora e dos Fungos" database website (http://inct.florabrasil.net/).

## Taxonomy

***Syncephalis obliqua*** H.M. Ho & Benny, Bot. Studies 49: 45 (2008). PLATE 1

SOMATIC HYPHAE hyaline, 1.5–2 µm wide, immersed in substrata or on host hyphae, weakly cyanophilous. SPORANGIOPHORES numerous, isolated, erect, simple, cylindrical, hyaline, smooth to slightly punctate, arising from the host hyphae or from the dung, broader at the base, 650–710 µm long, 15–17.5 µm diam., narrowing gradually towards the apex, 7.5–10 µm diam. just below the vesicle. RHIZOIDS well developed, hyaline to weakly pigmented, branching to form horizontal primary rhizoids that branch once or twice, septate. APICAL VESICLES globose to obovoid, hyaline, persistent or collapsing, cyanophilous, 62.5–77.5 × 52.5–62.5 µm, with about half of its apical surface covered by merosporangia, leaving conspicuous denticles on the surface after release. MEROSPORANGIA 4–6-spored, pedunculate, unbranched, thin-walled, hyaline, cylindrical, obliquely placed on the vesicle, usually detaching in mounts. MEROSPORES cylindrical to doliiform, rounded on both ends or eventually with one end truncate and the other rounded, hyaline, smooth, 5.5–6.5 × 2.5–3 µm. ZYGOSPORES not observed.

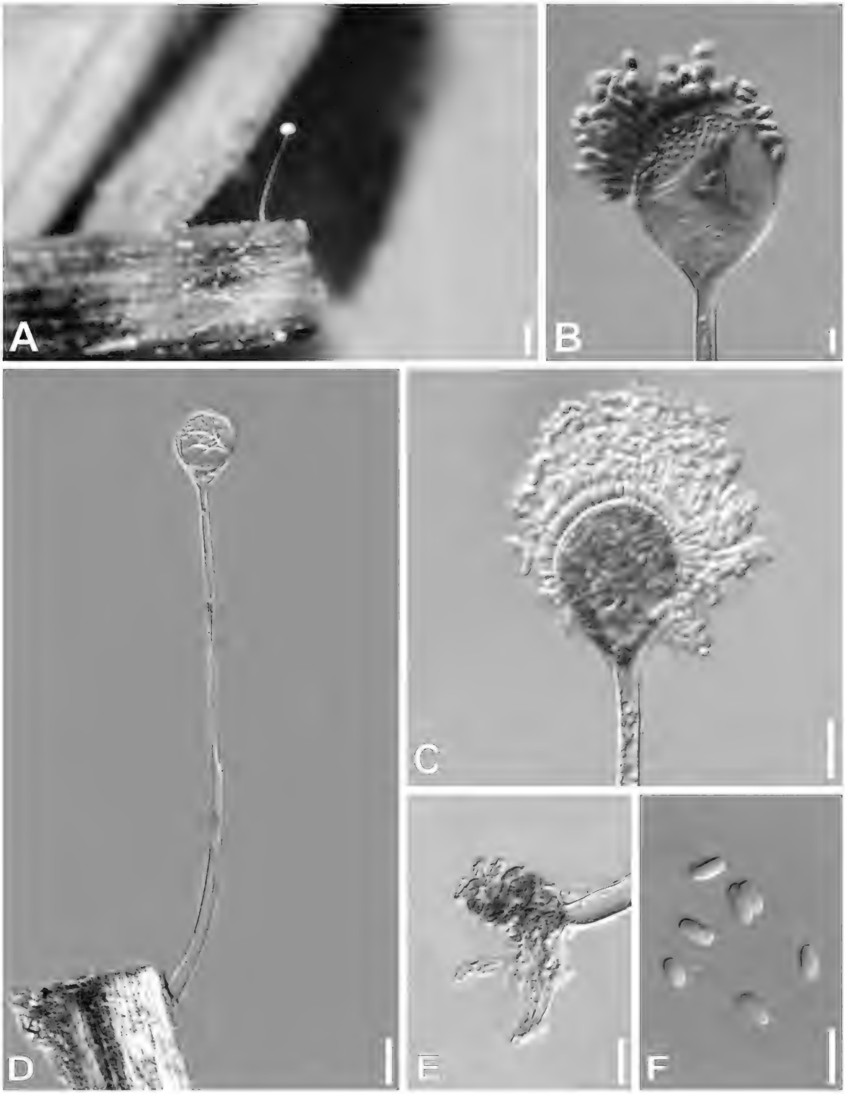

PLATE 1. *Syncephalis obliqua* (URM 87589a): A. sporangiophore growing on host immersed on dung; B. apical vesicle of a young sporangiophore, strongly cyanophilous, showing the obliquely placed merosporangia on the left; C. apical vesicle in a mature sporangiophore, with several visible multispored merosporangia; D. sporangiophore after merosporangia release, showing conspicuous denticles on the upper half of the vesicle; E. rhizoids; F. released merospores. Scale bars: A = 250 µm; B = 10 µm; C = 50 µm; D, E = 25 µm; F = 15 µm.

Habitat: Parasitic on *Ascobolus immersus* Pers. (*Pezizales*) and *Zopfiella longicaudata* (Cain) Arx (*Sordariales*) growing on horse dung.

Material examined: **BRAZIL. Pernambuco**, Recife, Dois Irmãos, Universidade Federal Rural de Pernambuco, IX.2011, R.F.R. Melo s.n. (URM 87588); XI.2014, R.F.R. Melo s.n. (URM87589a–f).

Distribution: Brazil and Taiwan. This is the first record from Brazil.

Notes: The main distinguishing feature of *S. obliqua* is the oblique placement of the merosporangia on the apical vesicle. It differs from *S. plumigaleata* by the larger merospores (6.5–10 × 3.5–4.5 µm; Embree 1965) and from *S. fuscata* (which produces similar obliquely placed merosporangia) in spore shape, ornamentation, and size (Kuzuha 1973). Our Brazilian specimens show a close morphological similarity with the descriptions of the Taiwanese material by Ho & Benny (2008). However, some merospores are slightly truncate at one end, which is not noted in the original description. Most specimens observed on incubated dung produced several sporangiophores (usually more than 100 per 5 g of dung) and persisted for 4–5 weeks. Although some sporangiophores arose from *Ascobolus immersus* apothecia and *Zopfiella longicaudata* cleistothecia growing on dung, clear signs of direct parasitism were not observed.

## Key to *Syncephalis* spp. recorded from Brazil

| | | |
|---|---|---|
| 1. | Sporangiophores single, strongly curved | *S. cornu* |
| | Sporangiophores single or in clusters, erect or slightly curved | 2 |
| 2. | Sporangiophores with irregular swellings, rarely branched, forming dense tufts | *S. aggregata* |
| | Sporangiophores without swellings, unbranched, single | 3 |
| 3. | Vesicle truncate; merosporangia cylindrical at the base and unilaterally branched | *S. penicillata* |
| | Vesicle and merosporangial base not as above | 4 |
| 4. | Merosporangia branched once at the base, the first spore being cordate, irregularly shaped | 5 |
| | Merosporangia unbranched | 6 |
| 5. | Vesicle asymmetric; merospores 4–8 × 2–4 µm | *S. asymmetrica* |
| | Vesicle symmetric; merospores 7.5–12.5 × 3.5–5 µm | *S. clavata* |
| 6. | Merosporangia obliquely placed at the vesicle | *S. obliqua* |
| | Merosporangia equally placed at the vesicle | 7 |
| 7. | Merosporangia 2–8 spored; merospores 6-8 × 8 µm long | *S. tengi* |
| | Merosporangia 3–4 spored; merospores 5-5.1 × 11-12 µm long | *S. sphaerica* |

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